Distance Learning and the Application of Technology: Culture Specific Measures in Technology Based Instruction

Christopher K. Gransberry
College of Southern Maryland

Determining the overall level of satisfaction among students who are being educated via distance learning methods and how instructional approach (synchronous versus asynchronous) varies, in terms of both knowledge outcome and level of satisfaction, is the hallmark of this study. It also considers student perception of online learning compared to face-to-face learning, and whether or not students can learn as much online as in person. Further, students can, in some cases, be more satisfied with online learning. Student success levels and satisfaction are, however, related to the level of engagement they experience and the cultural adaptability of the course work, as it relates to the online teaching methods used and the teacher's approach to online learning. Thus, the study concludes that distance learning is an appropriate approach for students but more research is needed regarding best practices for collaboration, content delivery, and adaptability.

Keywords: synchronous, asynchronous, cultural adaptability, cultural influence, technology, content delivery

INTRODUCTION

Students who have struggled to learn in a classroom environment, either in the primary or secondary educational setting, may especially struggle when forced to move out of the traditional classroom and into an online setting. Bearing in mind the importance of foundational skills, like writing and basic mathematics, on the growth and development of life-long skills, it is important to consider what opportunities technology-based learning may offer to reinforce areas where students are struggling, in spite of the loss of one-on-one interaction with an instructor. There is evidence that some uses of technology within the classroom offer large, positive effects on student mastery (Englert et al., 2007), but others report a correspondingly negative impact (Goldenberg et al., 2011). Thus, further exploration is needed to understand the relationship between these studies and what causes some approaches to be more successful than others. Research is also needed to determine how technology-based instruction in the classroom differs from distance-based learning, and what influence that has on student outcomes (Arrosagaray et al., 2019).

One element of this is gaining a clear understanding of how students feel about distance learning, and what is working well, or not well, as well as what is allowing the needed social interaction, or increasing feelings of isolation, as it relates to distance learning and classroom management (Adnan et al., 2020; Chen et al., 2020). Further, this includes an interest in understanding the need to measure students' knowledge or attitude and personality, as it relates to student outcomes and the use of distance learning and future success.

This can help to shed light on whether distance learning leads to higher or lower levels of student success, dependent on the learning environment and technological approaches employed.

Research Questions

A list of questions will be used to increase the focus of the study, and guide the research conducted. The research questions are as follows:

1. Does distance learning support or inhibit collaboration within student groups?
2. How does fully digital learning compare to hybridized and traditional models, and it relates to student success?
3. How do different students or types of students perceive distance-learning opportunities differently?

LITERATURE REVIEW

During the Covid-19 pandemic, a significant shift occurred in the approach to education, as an increased number of students transitioned to online, or distance learning, and thereby increased awareness of distance learning models (Adedoyin & Soykan, 2020). There are two basic models, or frameworks for online learning: asynchronous and synchronous learning (Lin & Gao, 2020). Synchronous forms of distance learning are learning activities in which all online learners are engaged at the same time, from different environments. This includes video conferencing, virtual classrooms or synchronous instant messaging within the class setting (Shoepe et al., 2020; Lin & Gao, 2020). In contrast, asynchronous learning includes online learning that does not happen simultaneously. Rather, every student has access course materials at a time of their convenience, and the instructor uses emails, discussion boards, and other accessible tools to carry out interactions with students (Shoepe et al., 2020; Lin & Gao, 2020). Students have noted that the way that they engage with coursework, and the sense of community they do, or do not feel when engaged in distance learning, depends on several factors including the format used for instruction (Lin & Gao, 2020). Previous literature suggests that students tend to prefer synchronous to asynchronous learning in terms of a sense of community but may prefer asynchronous learning for convenience. Further, the greater determining factor in student experience is the teacher, and whether or not they are creating an engaging and supportive classroom environment, using the technology tools at their disposal (Lin & Gao, 2020).

THEORETICAL FRAMEWORK

Several pedagogical frameworks are useful in developing a common theory of online education, or for exploring online education and its effectiveness among students (Picciano, 2017). Specifically, Learning Theory, Behaviorism, Cognitivism, and Social Constructivism can be combined to understand instruction and instructional events (Picciano, 2017).

Learning theory is the theory of how people learn and defines a set of principles for instruction and instructional technology. Graham et al., (2014) created a taxonomy which applies the learning theory to instructional taxonomy which asks the following questions:

1. **Explore:** "What exists?" and attempts to define [describe] and categorize;
2. **Explain:** "Why does this happen?" and looks for causality and correlation, and work with variables and relationships;
3. **Design:** "How do I achieve this outcome?" and describes interventions for reaching targeted outcomes and operational principles.

Behaviorism refers to how people act. It has been largely development by Skinner, and Pavlov. They argue that the mind and consciousness are not tied to the learning process, rather, people learn and so behave in response to stimulus (Picciano, 2017). Thus, what is important in educational design is the stimulus that is applied to students, and how it shapes their behaviors.

The third theory, Cognitivism, was developed by both Chomsky (1959) and Bloom (1956). Bloom developed a taxonomy of cognitive domains, including creating, evaluating, analyzing, applying,

understanding, and remembering. These are often applied to the level of cognitive engagement in the learning process, based on the type of learning activities that students are engaged in (Picciano, 2017). This can be used to explore online learning, and whether or not students are being engaged meaningfully on all of the levels of the cognitive taxonomy.

Finally, the last theory is social constructivism, as originally posited by Vygotsky, Dewey, and Piaget (Picciano, 2017). Vygotsky describes the learning process as establishing within the "zone of proximal development" or the levels of cognitive engagement in which the teacher, and the student, exist along with a clear problem to be solved (Picciano, 2017). This holds that the learning environment is a social environment, and the teacher's job is to create a social environment in which the learner can construct knowledge in a way that allows them to actively engage with solving the problem (Picciano, 2017). This can be related to online learning to determine whether or not this social environment is being constructed as it should be in the online setting.

METHODS

Data collection took place through collection and analysis of academic sources from several locations, including the ERIC educational database, Ebscohost Academic Search Elite, and various other scholarly archives. This resulted in a mixed-method approach, as both qualitative and quantitative studies were selected for inclusion. Because all data was collected second hand, participation was voluntary, all information was anonymous, and can be viewed as unremunerated. Participants were considered as it relates to the composite body of participants from primary studies. The overall sample included students at multiple levels of education from primary through tertiary study. There were not any specific exclusion criteria, though inclusion criteria included only empirical studies which had been published in academic sources. This resulted in a mixed method approach, which reports findings both as it relates to qualitative and quantitative factors.

Studies were searched for and selected based on a series of keywords related to the research questions. These included: distance learning, online education, student success, student perception, engagement, satisfaction, and online instruction. Studies were then included based on inclusion criteria. Studies could be no more than five years old, had to be available through the online databases searched in full text, and had to be published in English, as a primary language of study. Studies were excluded if they did not directly deal with student perception of student learning if they were not focused on secondary or tertiary student populations, and if their methodology was not clear and structured. This resulted in the final studies which were separated for qualitative and quantitative analysis.

In terms of quantitative analysis to carry out a meta-analysis of existing studies, the first step was to determine shared characteristics and their variables and create a shared measurement. As such, only Randomized Control Trial studies (RCTs) were used. All studies include were conducted from January of 2020 to March of 2020, and all measures were similar, including growth of knowledge, performance on objective assessment, satisfaction, and subjective student evaluation.

A total of nine RCT studies were included, resulting in total N= 975 participations included in the final sample for the quantitative portion of the analysis. All participants were students.

In terms of qualitative analysis, a review of the existing literature was conducted and coded according to shared themes, to determine the overall findings related to student perceptions and outcomes. The data analytics methods, and study materials are publicly available to fellow researchers.

DATA ANALYSIS

The Meta-analysis of existing data considered distance educational outcomes as compared to traditional educational outcomes for synchronous learning, asynchronous learning, online education, and face-to-face instruction (see Table 1). Factors that were considered included student perception of learning, student satisfaction with instruction, and student outcomes. Issues of perception were measured by the Likert scale,

while other statistical measure were used to describe or measure student outcomes. These were then used to compare with one another to create a shared consensus.

TABLE 1
COMPARISON OF MODALITY AND SYNCHRONICITY IN THE
LEARNING ENVIRONMENT

	Online	In-person
Synchronous	Webinar	Face-to-face/ traditional
Asynchronous	Learning management system	Independent study (not considered in the current meta-analysis)

Synchronous distance learning, or synchronous distance education, includes the use of various factors, or methods, including using videos for learning and use of online platforms like Moodle or Canvas, to allow learners in different locations to simultaneously engage in learning from different locations. This can include working form satellite campuses, international locations, or within the home setting (Alnabelsi et al., 2015; Lorenzo-Alvarez et al., 2019, Joshi et al., 2013, Moazami et al., 2014; Nelson, 2010; Spalla eta l., 2012; Nicklen eta l., 2016). The goal, however, of synchronous learning is to ensure that all students are online at the same time, and working together, in much the same way that students do during traditional learning. Another form of distance learning is online instruction, and asynchronous instruction, which is often self-paced and involves use of technology to lead instruction instead of relying on student direct interaction (Alnabelsi et al., 2015; Lorenzo-Alvarez et al., 2019, Joshi et al., 2013, Moazami et al., 2014; Nelson, 2010; Spalla eta l., 2012; Nicklen eta l., 2016) These methods can be contrasted with traditional, or face to face learning, which is the in-classroom approach that most campuses use (Alnabelsi et al., 2015; Lorenzo-Alvarez et al., 2019, Joshi et al., 2013, Moazami et al., 2014; Nelson, 2010; Spalla eta l., 2012; Nicklen et al., 2016; Constantine, 2012; Harned et al., 2014; Olsen & McCracken, 2015).

The quantitative analysis was conducted using statistical comparison of studies, the shared mean and standard deviation were calculated and used to determine the strength of the overall quantitative evidence related to these topics. This was intended to look for patterns in statistical significance or that findings found that a particular form of online learning had more statistically significant positive or negative outcomes than the other types.

Qualitative studies were more concerned with shared themes as it relates to the effect and perception of online learning. A review of 50 studies, with a total of 5 333 participants, collected between 2000 and 2020, shows a mean effect of .536 related to computer support of collaborative learning and student positive perception of that learning. These studies include all those considered in Sung's meta-analysis, with the addition of Chen et al., (2020) and Damary et al., (2016). These studies were codified by shared themes in the data, or common findings, which indicate that equal focus must be placed on the learning process and the products used to promote learning through online instruction. This includes shared factors that contributed to students liking, or disliking distance learning, dependent on their personal outcomes and platforms used.
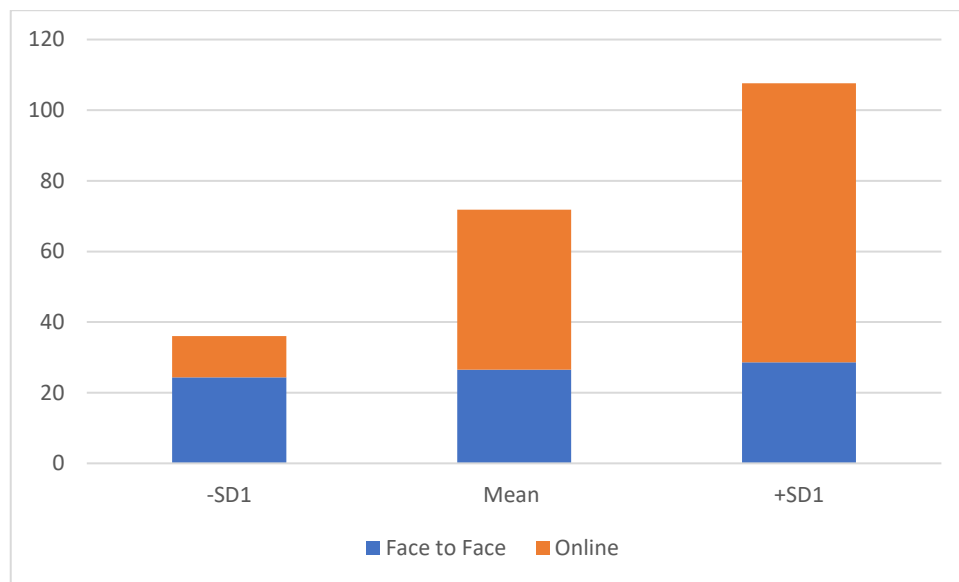
Specifically, findings from previous qualitative studies were codified, and then placed into a larger database through Nvivo, to look for shared themes and sentiments. The goals were to see if there were significant overlap in the factors that student participants noted or in their expressed feelings regarding various styles or approaches to online learning.

RESULTS AND FINDINGS

Quantitative studies consistently found a direct association between satisfaction and learning, both as it relates to online and face-to-face instruction. Students believe that the delivery method is effective if, and only if; they successfully master the course material.

Meta-analysis of seven studies (Alnabelsi et al., 2015; Joshi et al., 2013; Lorenzo-Alvarez et al., 2019; Moazami et al., 2014; Nicklen et al., 2016; Nelson et al., 2010; Spalla et al., 2012), which all focused on synchronous versus face-to-face instruction, found that there is not a measurable difference in outcomes for synchronous distance learning and traditional classroom educations (P=2.07). There were no discernable differences between the knowledge gained in each setting. Thus, the conclusion can be drawn that synchronous learning via online means is not statistically significant in terms of difference from traditional education in terms of effectiveness. What was noted, however, was that in the adult population, synchronous online learning had statistically significantly higher levels of student satisfaction, with overall polled level of satisfaction showed (SMD=.6, at the 95% confidence level) a higher level of satisfaction for those students engaged in synchronous online learning (see Figure 1).

FIGURE 1
LEVEL OF SATISFACTION IN SYNCHRONOUS STUDY

Further, the meta-analysis of data, which is expanded to include the remaining three studies (Constantine, 2012, Olson & McCracken, 2015; Harned et al., 2014), indicates that when comparing other forms of online instruction, asynchronous online to face to face instruction, satisfaction was consistently lower for online learning when compared to face-to-face instruction (g= -.33, vs g =.12). However, little to no statistically significant difference was seen in the comparison of online learning of any kind including webinars and asynchronous online learning. Overall, meta-analysis of the findings indicates that there is no change in satisfaction or learning based on the learning platform alone, but rather, synchronous, asynchronous, and face-to-face learning. Rather, negative outcomes and perceptions or levels of satisfaction were found to occur in all three settings, indicating that other factors, like teacher involvement and instructional strategies, were more significant in satisfaction and learning outcomes than the method of transmission itself. Further, levels of satisfaction may be impacted by student anxiety or other related factors, which cause students to have trepidation regarding the transition of online learning.

The findings of the quantitative studies can be correlated with those of the qualitative studies. Students generally state that they prefer coursework that feels interactive or allows for a sense of collaboration in learning (Chen et al., 2020; Sung et al., 2017). This is further evidence that it is the orchestration, or approach to teaching online, and not the distance learning medium (internet use) itself, that impacts student satisfaction and related positive outcomes (Blestrini et al., 2014; Chen & Chen, 2014, Chen et al., 2012; Choi & Im, 2015; Fonseca et al., 2014). In essence, these studies indicate that computer systems can support

collaborative learning, but only if the teacher is actively working toward that end, or building structures within the coursework through technologies that focus on collaboration and interaction. The overall findings indicate that using mobile devices can support collaborative learning if correctly applied, and this increased level of engagement, in turn, supports the overall satisfaction of students (Chen et al., 2020; Sung et al., 2017).

Chen et al., (2020) also indicated that the use of mixed asynchronous and synchronous learning may be effective for distance education to improve student learning. This has become especially apparent in the post-Covid environment.

The final set of factors to consider are challenges related to the multicultural context of online learning and education (Damary et al., 2016). There is a growing diversity in the population, especially in online learning settings like universities. This diversity must be considered in structuring online courses. Specifically, different countries or cultures approach distance learning and traditional classroom learning both in very different ways. In other words, it should not be assumed that satisfaction and student success are tied to synchronous, asynchronous, mixed, or face-to-face instructional settings alone but may also be tied to teacher approach and cultural norms. This factor has not been actively addressed in the studies, up to this point. Low satisfaction rates may be related to, not the potential for learning, but rather the instructor's role, and a lack of cultural awareness in distance learning. In an online setting, teachers may be completely unaware of their students' cultures and the needs related to those cultures, for example. Further, it is unknown if online learning allows for meaningful differentiation related to culture. As such, it could be said that this is an area where further research is needed. More specifically, cultural dimensions influence success but may not be appropriately addressed online.

DISCUSSION

Both the qualitative and quantitative findings support the use of online learning and show that it can be an effective means of delivering instruction (Chen et al., 2020; Sung et al., 2017; Alnabelsi eta l., 2015; Joshi et al., 2013; Lorenzo-Alvarez et al., 2019; Moazami et al., 2014; Nicklen et al., 2016; Nelson et al., 2010; Spalla et al., 2012). There is nothing inherent in online delivery that makes it sub-par when compared to traditional learning approaches. That said, there is a risk of online learning failing to satisfy students. Two primary causes of this, as revealed in the qualitative analysis, is a lack of engagement, or collaboratives, and a lack of cultural awareness in how students are engaged and the materials used. Thus, an area for future research is the application of online tools to deliver engaging and content-driven instruction through online platforms. This means gaining an understanding of what is most effective to engage students, including different technologies, different types of projects, and a mixture of synchronous and asynchronous lesson delivery.

CONCLUSION

There is no avoiding that distance learning is becoming more common in all educational arenas, and the special challenges posed by COVID-19 have only made this more necessary. As such, there is also a shared need to examine the effectiveness of distance learning, and online learning technologies as it relates to or compares with traditional learning, and as it impacts various subsets of the largest population. The aim of the current meta-analysis, and qualitative review of codified literature, is to consider the effectiveness of various online learning approaches in allowing students to meet content objectives or gain knowledge, and to satisfy student's social and educational needs in various cultural settings. This includes use in elementary, higher education, and even professional training settings. There appears to be a positive causal relationship between student satisfaction and learning success in a given setting. Correlation analysis found that webinars are useful to supplement but not replace face-to-face learning; however, synchronous learning may provide a promising approach to instruction when students cannot physically be in the same physical location. In the current situation, rapid adaptation to remote teaching was required; however, there

is a lasting need to research the methods of instruction used, their impact on students, and what implications that has for best practices as it relates to distance learning long term.

True study of distance learning within the COVID-19 crisis is still limited, and so extension of studies largely related to distance learning in the secondary setting, like online coursework in college, has been extended to the conversation. This creates a limitation in the assumption of comparative generalization across populations. Further, because this is a meta-analysis of existing data, it does not use primary data, which comes with its limitations as it relates to aligning evidence and making assumptions about sample populations and the accuracy of findings in previous studies.

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